

Translation

PATENT COOPERATION TREATY

PCT/EP2003/001192



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 9715.PT-WO PM/TE	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP2003/001192	International filing date (day/month/year) 06 February 2003 (06.02.2003)	Priority date (day/month/year) 14 March 2002 (14.03.2002)
International Patent Classification (IPC) or national classification and IPC G06T 11/00, G01S 15/89		
Applicant TOMTEC IMAGING SYSTEMS GMBH		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 09 October 2003 (09.10.2003)	Date of completion of this report 15 April 2004 (15.04.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP2003/001192

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
pages \_\_\_\_\_ 1-15 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_ 1-18 \_\_\_\_\_, filed with the letter of \_\_\_\_\_ 09 March 2004 (09.03.2004)
- ☒ the drawings:  
pages \_\_\_\_\_ 1/5-5/5 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☒ the claims, Nos. \_\_\_\_\_ 19.20.21 \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP 03/01192

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	6-11, 12-15	YES
	Claims	1-5, 16-18	NO
Inventive step (IS)	Claims	6-11	YES
	Claims	1-5, 12-18	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims		NO

## 2. Citations and explanations

## 1. Reference is made to the following documents:

D1: US-A-5924989  
D2: US-A-4386528  
D3: US-A-5787889.

2. The application fails to meet the requirements of PCT Article 6 because **claims 1, 6 and 16** lack clarity.

i) In claims 1, 6 and 16, the term "*data transformation*" lacks clarity since it indicates, albeit in a vague manner, a relationship between the first and second space groups, without said relationship being more precisely defined. Thus, for example, every conceivable kind of extrapolation and interpolation are encompassed by the above term.

ii) Furthermore, the term "*search beam*" in claim 1 is misleading since nothing is sought along said beam, the first space element being merely

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projected in the direction defined by the beam onto the second space elements. The direction is "preselectable" and, therefore, completely arbitrary.

3. The subject matter of independent claims 1, 16, 17 and 18 is not novel (PCT Article 33(2)).

**Claim 1:**

D1 discloses:

- i) *a method for reconstructing multi-dimensional objects from one-dimensional or two-dimensional image data, in particular from ultrasound image data, by capturing one-dimensional or two-dimensional image subdomains of the object, the absolute spatial locations of the individual image subdomains and/or the spatial locations of the individual image subdomains relative to one another being used in conjunction with the one-dimensional or two-dimensional image data from the individual image subdomains for generating one-dimensional or two-dimensional image data: "a method for generating a diagnostically acceptable three-dimensional image data record with the use of an ultrasound unit (...), with the use of an image-processing system connected to the ultrasound unit (...), and with the use of a position-sensor system which determines the position and orientation of the ultrasound head and hence the spatial location of the image plane of the ultrasound*

*/...*

image generated in each instance (...), where these position and orientation data of the sensor system are likewise transmitted to the image processing system" (see column 1, lines 14-34);

- ii) *wherein a first space element group of first space elements, which contain multi-dimensional image data and contact or intersect the planes or lines of the image subdomains, is generated in a multi-dimensional voxel space by means of the one-dimensional or two-dimensional image data: "this three-dimensional digital data record 19 is produced so that it contains a plurality of individual volume elements 20 (voxels) (...) each image point 20' of the images forming the raw data 18 is filed away in its proper position in a corresponding voxel 20 of this three-dimensional record" (see column 4, lines 19-26; figure 6); in other words, the captured two-dimensional ultrasound images are "fitted" to a three-dimensional voxel space and thus represent the first space groups;*
- iii) *that a second space element group of second space elements is generated in the multi-dimensional voxel space, and that the first space element group and the second space element group form the multi-dimensional voxel space and that the second space element group of second space elements in the multi-dimensional voxel space is generated from the multi-dimensional image data of the first space element group by means of a data*

/...

*transformation: "if a particular region of the volume to be examined has not been captured upon image capture, no image value can be assigned to the corresponding voxel (...), i.e. the three-dimensional data record would then contain gaps which, however, can be filled by interpolation" (see column 4, lines 16-31), the "particular region of the volume" being the second space element group and the "interpolation" being the data transformation; thus, the entire voxel space is composed of said particular region of the volume, that is to say the second space element group, together with the ultrasound images originally captured, that is to say the first space element group;*

- iv) that a search beam from each first space element along a preselectable multi-dimensional direction vector defines the second space elements that are determined by the multi-dimensional image data of the first space element which forms the starting point of the search beam: in D1, the elements of the second space element group are formed by interpolation from the closest elements of the first space element group, in other words the closest elements of the first space group are projected along a "search beam" in a direction that is perpendicular to the first space element group onto the corresponding element of the second space element group (see X1, X2, X3, X4 in figure 7), where they are weighted and linked (see column 7, lines 13-20) or, alternatively,*
- /...*

only a single closest element from the first space element group is projected onto the element from the second space element group (see column 7, lines 55-60);

Thus, claim 1 lacks novelty.

It should be noted here that D3 is also prejudicial to the novelty of claim 1.

**Claim 16:**

The above objection applies similarly to claim 16, since the device features of said claim are substantially the same as those of claim 1.

It is also advised that the expression "*device for implementing a method according to one of the preceding claims*" can denote only a device which is suitable for the implementation of such a method, not that said method is necessarily carried out. A device of the type in question is clearly disclosed in D1.

**Claim 17:**

D1 describes a method used "for tomographic image capture of organs in motion, in particular of organs whose motion is directly related to the beating of the heart (e.g. cardiac vessels)" (see column 4, lines 40-43) and, therefore, said document is prejudicial to the novelty of the subject matter of claim 17.

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**Claim 18:**

Since D1 mentions the examination of "cardiac vessels" (see column 4, line 43), intravascular echo cardiography is implicitly disclosed and, as a result, the subject matter of claim 18 lacks novelty.

4. Moreover, the subject matter of dependent **claims 2-5** is not novel (PCT Article 33(2)) and the subject matter of dependent **claims 12-15** is not inventive (PCT Article 33(3)).

**Claims 2-5:**

Said claims define only conventional details of a distance-weighted interpolation as disclosed in, for example, D1 (see column 7, lines 13-60) and D2 (see column 2, lines 1-18 and column 2, line 50 to column 3, line 3);

**Claims 12-15:**

See D3, column 14, line 65 to column 15, line 7 and column 18, line 66 to column 19, line 11.

5. The subject matter of independent **claim 6** is novel (PCT Article 33(2)) and involves an inventive step (PCT Article 33(3)).

D1, the closest prior art, discloses the interpolation of the second space elements from the closest first space elements (see column 7, lines 13-20 and 55-60).

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However, claim 6 also discloses a special data structure for the image data of each second space element, the spatial and/or temporal distance (x, t), and an indicator for the plane or line of the image subdomain also being stored therein.

Proceeding from D1, a data structure of this type for the coded representation of the image data of the second space elements does not appear to be obvious for a person skilled in the art, and claim 6 is therefore considered inventive.

Additional observations:

1. The claims include the two independent method claims, claims 1 and 6, that is to say two independent claims in the same category. In consequence, the claims are not concise and fail to meet the requirements of PCT Article 6.
2. Contrary to PCT Rule 5.1(a)(ii), the description does not cite documents D1 or D3 or indicate the relevant prior art disclosed therein.